



de maximis, inc.

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September 24, 2013

Melissa Taylor
EPA Project Manager, Nuclear Metals Superfund Site
United States Environmental Protection Agency, Region 1
5 Post Office Square, Suite 100
Boston, MA 02109-3912

**Subject: Response to Comments on Depleted Uranium Metal Exterior Site
Characterization Survey Plan
Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts**

Dear Ms. Taylor:

We have reviewed the comments on the Depleted Uranium Metal Exterior Site Characterization Survey Plan (Plan) received on September 23, 2013. Attachment 1 provides our response to each comment. For reference, each comment is restated prior to our response. Attachment 2 provides the revised Plan. We will initiate this work upon receipt of your approval of the revised Plan.

Sincerely,

Bruce Thompson, Project Coordinator

cc: Garry Waldeck, MassDEP
Andy Schkuta, AECOM
Respondents

Encls: Attachment 1 – Responses to Comments
Attachment 2 – Revised Depleted Uranium Metal Exterior Site
Characterization Survey Plan

Attachment 1
Responses to Follow-up Comments

Attachment 1
Response to Comments- Depleted Uranium Metal
Exterior Site Characterization Survey Plan

1. **Comment:** *Recommend adding the soil areas along the entrance roadway to the property boundary on Main Street.*

Response: The requested soils areas have been added to the survey.

2. **Comment:** *Add building numbers to Figures 1 and 2.*

Response: Building identification letters have been added to the figures as requested.

3. **Comment:** *Indicate location of surface contamination found 'north of Building D' to Figure 2.*

Response: The location of the surface contamination north of Building D has been added to Figure 2.

4. **Comment:** *They state the surveys will be carried out "in compliance with" MARSSIM. This is not a Final Status Survey, so compliance isn't necessary. It is recommended "in compliance with" be replaced with "following the guidance of" MARSSIM.*

Response: The requested language has been changed as requested.

5. **Comment:** *Action levels: are the action levels in sections 3.1 and 3.2 for soil and concrete/asphalt, respectively? The document is slightly confusing as to which action level is used when, or is it the lesser of the two that is used, i.e., 20,000 cpm for the Ludlum 44-10 or 5,000 cpm beta for the 2350? What concentration (pci/g) does 20,000 cpm correspond to? In your reply to Garry Waldeck you indicated that 2x background will exceed 2.3 pci/g, but you did not indicate what the concentration would be at 20,000 cpm. It sounds like there are separate action levels for soil and asphalt/concrete but it is not clear. Please advise.*

Response: The action level stated in Section 3.1 is for gamma emissions and covers both soil and concrete/asphalt. The gamma survey action level of 20,000 cpm, or 2x background, is to identify discrete pieces of DU metal only and does not have a direct correlation to soil concentrations in pCi/g.

The action level in Section 3.2 of 5,000 dpm / 100 cm² is applicable for alpha and beta emissions on concrete/asphalt surfaces only. The survey instrument selected is not appropriate for survey of soils. The alpha and beta survey is to identify surface contamination on concrete/asphalt.

6. **Comment:** *Table 1 does not include the Ludlum 2221, however it is indicated in the plan that this instrument will be used.*

Response: The text has been updated to indicate that a Ludlum 2350-1 will be used.



de maximis, inc.

Attachment 2
Revised Depleted Uranium Metal Exterior Site Characterization Survey Plan

DEPLETED URANIUM METAL EXTERIOR SITE CHARACTERIZATION SURVEY PLAN

**Nuclear Metals, Inc. Superfund Site
Non-Time-Critical Removal Action
Concord, Massachusetts**

Prepared for:



de maximis, inc.

200 Day Hill Road
Suite 200
Windsor, CT 06095

Prepared by:



Decontamination Decommissioning and Environmental Services, LLC
345 North Avenue, 2nd Floor
Wakefield, MA 01880

September 2013

Revision: 1



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1. Introduction and Background

This Depleted Uranium Metal Site Characterization Survey Work Plan (Work Plan) has been developed in support of the Non-Time-Critical Removal Action (NTCRA) Phase 1 Construction Submittal (*de maximis, inc.*, March 2013), at the Nuclear Metals, Inc. (NMI) Superfund Site in Concord, Massachusetts (Site). The characterization survey is being performed under the NTCRA Health and Safety Plan (HASP) and the Radiation Protection Plan (RPP) provided as Appendix C to the HASP.

Several small (30-60 grams each) discrete pieces of depleted uranium (DU) metal were identified outside the buildings by health physics technicians near the former employee entrance while performing routine radiological monitoring on August 2nd, 2013. More DU metal pieces were found in a grassy area between parking levels in the north parking lot. The DU metal was found in the upper two inches of soil covered by vegetation. Due to this discovery, surveys of target soils areas (see Figure 1) are recommended to determine if DU metal is present in other areas at the Site.

The scope of the Work Plan also includes the evaluation of asphalt and concrete paved areas around the Site in areas that are not identified for remediation in the Feasibility Study (FS). The Remedial Investigation (RI) /FS process assessed and found fixed radiological contamination on asphalt and concrete surfaces in the "Industrial Area East" or "A6" area (see Figure 2). The A6 area is targeted for remediation that will result in removing the affected asphalt and concrete. The RI pavement assessment did not extend beyond the A6 area. During scanning of NTCRA waste containers this summer, we became aware of some fixed radiological contamination on asphalt and concrete surfaces north of Building D. Accordingly, a comprehensive assessment of asphalt and concrete surfaces not



currently targeted for remediation is proposed, so that any impacted areas can be appropriately managed.

The activities under this Work Plan are being undertaken to identify if DU metal is present within the top 6" of soil or on paved surfaces in target areas; and if DU contamination is present on concrete or asphalt surfaces not currently identified for remediation in the FS. With such information, we will be able to (a) eliminate potential health risks by extracting and safely disposing of DU metal pieces and immediately adjacent affected soils, and (b) identify areas for further investigation and/or remediation, either pursuant to the NTCRA or as part of the final remedy for the Site.

The areas where DU metal was found are currently within the secured fence around the Site. However, when the facility was in operation, these areas were not secured. This indicates that DU metal was taken outside the controlled radioactive material interior areas in the past. It is unclear why DU metal was discarded near walkways or between parking lots. This Work Plan provides for an assessment of the soil areas adjacent to the paved roadways and parking areas on-site to determine if additional DU metal is present in the upper layer of soils. Due to the shielding effect of soil on the radioactivity emitted by DU, the best available technology will only be able to detect DU metal in the upper 6" of soil, which will be sufficient to find DU metal that has been incidentally disposed and that could present a health risk, such as the DU metal that triggered preparation of this Work Plan.

This Work Plan also provides for an evaluation of the extent of DU contamination on the surface of exterior asphalt and concrete surfaces. Accordingly, the asphalt and concrete areas shown on Figure 2 will be surveyed using two separate techniques to determine if the elevated radioactivity is attributable to



surface contamination or from DU metal buried beneath. The areas will be scanned first with Ludlum 2"x2" Sodium Iodide (NaI) scintillator probe/GPS combination followed by a gas proportional probe large area probe/GPS combination. Fixed and removable contamination measurements will then be obtained at designated intervals across the survey areas.

2. Characterization Survey

Surveys will be performed to characterize residual radioactivity in each survey unit. Characterization surveys of open soil areas will be conducted by performing scan surveys with a 2x2 NaI instrument only. The asphalt and concrete surfaces will be scanned using the same technique. The asphalt and concrete areas also will be scanned with an alpha/beta gas proportional instrument and total activity measurements and removable contamination measurements will be obtained. All survey data will be documented on survey maps and associated data information sheets.

Radiological surveys will be performed in the areas shown on attached Figures 1 and 2 (target soil and paved areas, respectively). The target areas will be divided into individual survey units.

This section addresses the following:

- Surface Contamination Scans;
- Total Surface Activity Measurements;
- Removable Activity Measurements; and
- NaI GPS Walkover Survey.

The characterization survey as well as the removal and packaging of radioactive wastes (discussed further in Section 5) will be carried out in compliance with the NTCRA HASP, Radiation Protection Plan and guidance from NUREG 1575: "Multi-



Agency Radiation Survey and Site Investigation Manual” (MARSSIM), Rev 1 and NUREG 1727, “NMSS Decommissioning Standard Review Plan,” NUREG 1757, V.2, “Characterization, Survey and Determination of Radiological Criteria.”

2.1 Surface Contamination Scans

Scanning is used to identify locations within a survey unit that exceed the action level, as defined in Section 3.1. Locations that exceed the action levels will be marked and will be subject to additional investigations. For exposed soil, the additional investigation will determine whether DU metal is present. For paved areas, the additional investigation will determine the concentration, area, and extent of the contamination.

Scanning will be performed by moving the probe over the subject surface at a distance from the surface of 3 cm or less, and at a rate less than the maximum scan rate necessary to achieve the specific MDC_{scan} for the instrument. The MDC_{scan} is defined as the maximum rate in which a probe can be moved across a surface to maintain the ability to detect a specific level of contamination.

Areas of elevated activity that are detected during the scan surveys will be marked and total and removable surface activity measurements taken. However, these total surface activity measurements are in addition to the static measurements required for the statistical test.

2.2 Total Surface Activity Measurements

Total activity measurements will be taken on asphalt and concrete surfaces in the target areas to the extent practical utilizing instrumentation oriented for the best detection geometry, based on the surface at the survey location. Additionally, locations of elevated activity identified and marked during the scan survey will also receive total activity measurements. Total surface activity measurements will be



taken at each determined sample location. Scaler count times were determined based on the MDC_{static} of the applicable survey instrument. The MDC_{static} of an instrument is determined by the active surface area of the probe, count time, and background count.

The derivation of MDC_{scan} and MDC_{static} MDCs will take into account instrument efficiencies (surface and detector), scan rates and distances over surfaces, surveyor efficiency, and minimum detectable count rate, using guidance in the MARSSIM (NRC 2000) and NUREG 1507 (Abelquist, et al. 1998).

The survey methodology specified in this section is consistent with the provisions of NUREG-1757, Volume 2 (NRC 2006) and with the guidance found in NUREG-1575, *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* (NRC 2000).

2.3 Removable Contamination Measurements

Removable contamination measurements (smears) will be collected on asphalt and concrete surfaces at each total beta activity sample location to determine the potential removable contamination. An area of approximately 100 cm^2 shall be wiped if possible. If an area of less than 100 cm^2 is wiped, a comment will be added to the survey data sheet estimating the surface area wiped to allow for area correction of the results.

2.4 NaI GPS Walkover Survey

The objective of the NaI GPS walkover survey is to locate discrete pieces of DU metal in soil or under asphalt and concrete areas on the Site. This survey will provide gamma scanning of the designated accessible non-paved and paved areas on the Site as indicated on Figures 1 and 2. Non-accessible areas are those areas with obstructions or conditions which interfere with close contact with the target surfaces to be evaluated (trees, steep terrain, electric transformers, etc.).



A GPS-enabled survey instrument will be used to pinpoint potential locations of DU metal and the data collected during the walkover surveys will be datalogged. Waypoints will be used to aid the survey team in scanning straight-line traverses across each survey unit. Each survey unit will mark the parallel traverse paths using stakes, ropes, or equivalent methods so that travel paths are two feet apart from each other. A health physics technician will swing the probe from side to side covering a two (2) foot wide path with each traverse.

Physical marking of the field locations that indicate the presence of DU pieces during screening will be accomplished by dropping a flag at the elevated reading location. The GPS survey will be completed for the survey unit prior to evaluating individual elevated readings.

The storm catch basins will be evaluated as part of the Nal walkover survey. Technicians will ensure inclement weather has not occurred within 24-48 hours and confirm the basins are free of water prior to scanning. The Nal detector will be carefully lowered into the catch basin and a one-minute static reading will be obtained.

3. Survey Instrumentation and Operation

3.1 Nal Gamma Walkover Survey

Health physics personnel will be equipped with a Ludlum 44-10 (or equivalent) 2x2 Nal scintillation detector coupled with a Trimble GPS GEOEXPLORER 6000, or equivalent, for the purposes of the gamma walkover survey. The detector will be paired with Ludlum 2350-1 (or equivalent) survey meter. Readings will be counted automatically every 1-2 seconds and data logged for retrieval. Health physics technicians will utilize headphones in order to gauge the increased counts over background. The gamma scan sensitivity for DU using this



instrumentation is 56 pCi/g based on NUREG 1575 MARSSIM Rev. 1, Table 6.7. The average concentration of each of the ten (10) DU metal pieces previously recovered was approximately 250,000 pCi/g.

In order to provide maximum efficiency and coverage, a gamma scintillation detector will be attached to a rope that will allow for the technician to swing the detector left and right in a two (2) foot arc while walking forward at a scan rate of two (2) feet per second and maintaining a detector distance-to-surface of approximately 6 inches. Technicians will pass the detector over the surface in a serpentine traverse pattern. Technicians will maintain a course within the established roped-in survey areas from one end to the other covering the entire designated area.

Typical background measurements for the Ludlum 44-10 are 10,000 counts per minute (cpm). For this survey, greater than 2x background will be considered the “action level.” This action level has no correlation to risk based criteria, it is only intended to locate discrete pieces of DU metal in soil. Any measurements greater than 2x background will be marked for a more thorough follow up scan at a later time. The value of 2x background has been selected based as a determination point for further investigation. The gamma survey data will be analyzed to determine if other areas will require further investigation.

All gamma instrumentation will have current third-party calibration within the past 12 months. Daily function, background, and source checks will be performed in accordance with the site Health Physics Procedures HP-NMI-15, “Instrument Response Checks” and HP-NMI-2, “Operation of the Ludlum 3 with a 44-10.” Any instrument that does not satisfy daily performance requirements will be removed from service and tagged as such. The NaI gamma walkover survey will be completed in compliance with the Survey Instructions provided in



Attachment A. Table 1 below lists radiation detection instruments and typical operating parameters.

3.2 Asphalt and Concrete Areas Beta Surveys

These beta surveys will be accomplished using the survey process described above. This will be followed with a 100% beta surface scan using a Ludlum 2350-1 or equivalent, with 43-37 gas proportional probe to identify areas of elevated beta activity. A value of 5,000 dpm/100cm² beta for total contamination has been selected as a determination point for further investigation. The beta survey data will be analyzed to determine if other areas require further investigation.

The sampling locations will be established in a defined pattern beginning with the random start location and the determined sample spacing. Maps will be generated for each survey unit's permanent surfaces included in the statistical tests. Random starting points will be determined using computer-generated random numbers coinciding with the x and y coordinates of the total survey unit. A grid is plotted across the survey unit surfaces based on the random start point and the determined sample spacing. A systematic grid will be established based on the size of the survey unit following the guidance of NUREG 1575 MARSSIM. Total and removable contamination measurements will be obtained from each grid intersection. Total contamination measurements will be obtained for a period of one minute with a Ludlum 2224 with 43-89 alpha/beta scintillator probe. Removable contamination smears will be analyzed with a Tennelec Series 5 proportional counter.

Daily function, background, and source checks will be performed in accordance with the site Health Physics Procedures HP-NMI-15 Instrument Response Checks, HP-NMI-20 Operation of the Ludlum 2350-1, HP-NMI-21 Operation of the



Ludlum 2224-1 and HP-NMI-22 Tennelec Series 5 Operation. The survey will be completed in compliance with the Survey Instructions provided in Attachment A.

Table 1 – Instruments and Typical Operating Parameters

Measurement Type	Detector Model	Meter Model	Scan Rate	Count Time	Background (cpm)	MDC (dpm/100cm ²)
Gamma Surface Scans	Ludlum 44-10	Ludlum Model 3	2 ft./sec.	NA	10,000	56 pCi/g
Beta Surface Scans	Ludlum 43-37 Floor Monitor	Ludlum 2350-1	4 in./sec.	N/A	1,200 (β)	1,708 (β)
Total Surface Activity	Ludlum 43-89	Ludlum 2224	N/A	1 min.	1 (α) 146 (β)	36 (α) 299 (β)
Removable Activity	Tennelec Series 5	N/A	N/A	2 min.	0.15 (α) 0.83 (β)	11 (α) 8 (β)

4. Interim Data Analysis

Upon completion of the GPS walkover survey, the project team will assemble the data obtained into a comprehensive survey report that will include areas located on the Site Map on Figures 1 and 2. The distribution of action level exceedances will be reviewed to determine if the total walkover survey area needs to be expanded beyond the initial areas identified on Figures 1 and 2.

If additional areas need to be surveyed, additional figures indicating the areas to be included in the supplemental survey will be prepared and discussed with EPA prior to implementation.

Areas exceeding the action level will be clearly marked for further investigation. Marking methods may include flagging or spray-painting each area, so it can be identified for follow on investigation. The data obtained during this characterization survey will be analyzed to determine the best course of action to remove DU metals identified from the upper 6 inches of soils.



5. Removal of DU Metal in Soil

Soil areas exceeding the action level will be hand excavated to identify DU metal. Prior DU metal removal noted visible yellow uranium oxide as well as radioactivity (see Figure 3, which shows excavated DU metal).

DU metal, if present, will be removed and packaged separately from surrounding soil. These pieces will be unearthed using hand tools. Sifters may be used to separate soils from discrete pieces of DU. Each piece of DU metal will be packaged for disposal separately. Health physics personnel will scan the soils and debris as they are unearthed to identify the DU metal and impacted soils. Technicians will be monitored and don appropriate PPE as described in a specific Radiation Work Plan (RWP) during these activities. Once DU metal pieces are uncovered, they will be placed into 55-gallon drums, or similar waste containers. All waste containers will be properly labeled and inventoried. The exterior of waste containers will not contain removable contamination in excess of 1,000 dpm/100cm² (alpha) prior to movement to a designated interior waste storage area for DU metal pieces. Technicians will ensure that discrete DU metal pieces will be separated from the soil.

All soil margins within 12-inches of the DU metal piece and/or visual contamination (i.e., yellow or green discoloration) will be excavated and placed in 55-gallon containers and managed as radioactive waste. If no DU metal is found, the soil that triggered the action level exceedance will still be removed. Removal of soils from each location will generally be limited to 4 cubic feet total. Each area of DU metal and/or soil removal will be recorded for later follow on investigation and remediation after the Record of Decision (ROD) is issued for the Site and remediation goals for depleted uranium are established. At that



time, an appropriate procedure to investigate these locations can be established, as well as confirmation sampling protocols to meet the remediation goals.

Once sealed, each waste container will be transported into the buildings where it will be secured and staged in a dedicated waste storage area prior to off-site disposal with the other NTCRA wastes. An inventory of contaminated soil and DU metal will be maintained.

Areas of pavement exceeding the action levels will be marked and recorded for future removal. Depending on the locations, areas and volumes of affected pavement, these areas will be removed under the NTCRA. If the areas cannot be effectively addressed under the NTCRA, the locations will be carried forward for remediation post-ROD. If sub-pavement soil also exceeds action levels, such soil will be investigated to determine if DU metal is present. If present, DU metal and nearby soil will be addressed as described above.

6. Summary Report

At the completion of the characterization survey, follow-on survey(s) and soil excavation, a report will be prepared to document the results. This report will detail locations of soil and pavement that exceeded action levels, results of follow on soil investigation and excavation, volumes of soil removed, and areas of pavement that the exceeded action level.

7. Radiation Protection and Health and Safety

DU metal pieces may become oxidized over time from environmental exposure and produce uranium oxide that may flake off and contaminate adjacent soils. Due to potential elevated levels of DU contamination in the surrounding soils, the scope of work will be performed under the RPP using specific RWP's and job



safety analysis (JSAs) in compliance with the NTCRA HASP. These work control documents identify hazards and controls necessary to properly protect NTCRA workers involved in the implementation of this Work Plan and maintain worker exposures As Low As Reasonably Achievable (ALARA).

The following RWP's have been developed for this scope of work:

- NMI-007 (General RWP) for identification, inventory, sampling, and minimally invasive activities in exterior areas of the Site; and
- NMI-008 (Specific RWP) for surveys, sampling, decontamination, packaging of radiologically impacted materials, landscaping, grading, and excavation or movement of soils in exterior areas of the Site.

These specific RWP's are included as Attachment B. The following JSA, included as Attachment C, has been developed to cover each phase of work under this survey plan: JSA-EQ-008, "Soil Sampling/DU Metal Unearthing."

All recovered pieces and soil from removal operations will be conducted under the direct supervision of a health physics technician with oversight by the Site Radiation Safety Officer (RSO).



REFERENCES

- DDES, LLC, 2012(a). *Regulated and Hazardous Materials Assessment and Segregation Plan*, Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts, May 2012.
- de maximis, inc.*, 2012(a). *ARARs Implementation Plan*, Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts, January 2012.
- de maximis, inc.*, 2012(c). *Health and Safety Plan*, Nuclear Metals Inc. Superfund Site, Concord, Massachusetts, January 2012.
- de maximis, inc.*, 2012(d). *Emergency Response Plan*, Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts, January 2012.
- de maximis, inc.*, 2012(e). *Field Sampling Plan/Quality Assurance Project Plan*, Nuclear Metals, Inc. Superfund Site, Concord, Massachusetts, January 2012.
- NUREG 1575: "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), Rev 1.
- NUREG 1727, "NMSS Decommissioning Standard Review Plan", NUREG 1757, V.2, "Characterization, Survey and Determination of Radiological Criteria."
- NUREG 1505, "A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys."
- USEPA, Nuclear Metals, Inc. Superfund Site, Administrative Settlement Agreement and Order on Consent for Non-Time-Critical Removal Action, Docket No. CERCLA-01-2011-004, January 2011.



Figure 1

**DEPLETED URANIUM METAL EXTERIOR SITE CHARACTERIZATION SURVEY
PLAN TARGET SOILS AREAS**

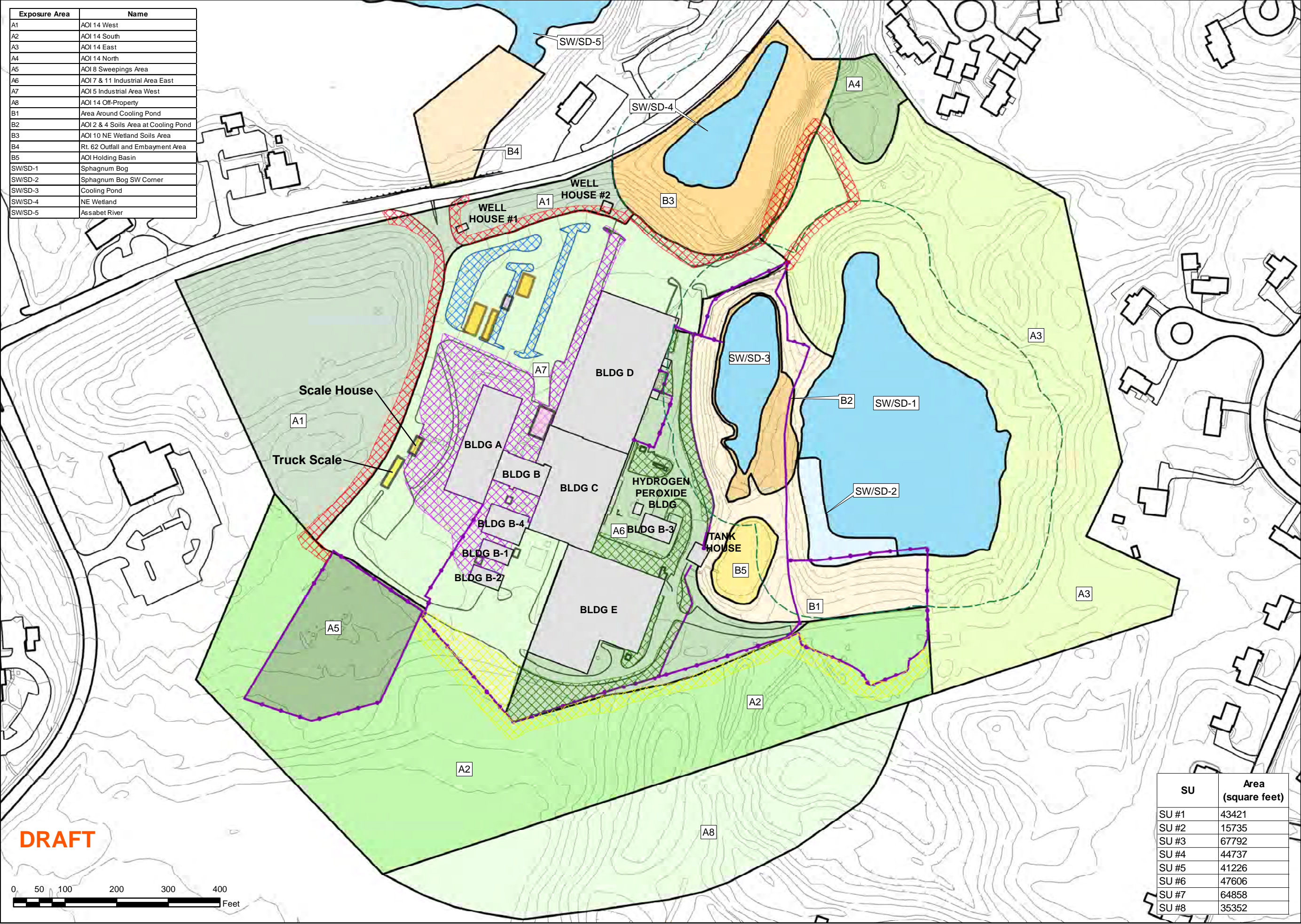


Figure 1 **DRAFT**

**DEPLETED URANIUM
METAL EXTERIOR SITE
CHARACTERIZATION
SURVEY PLAN
TARGET SOILS AREAS**

Nuclear Metals Inc. (NTCRA)
Concord, Massachusetts

- Map Legend:
- SU #1
 - SU #2
 - SU #3
 - SU #4
 - SU #5
 - DU metal locations found during routine scans
 - "A" Exposure Area
 - "B" Exposure Area
 - Surface Water/Sediment Exposure Area
 - Fence
 - 100' Wetland Buffer Zone Around Bog, Wetland
 - Truck Scale Equipment
 - Work Trailer
 - Building

Note:
All locations and dimensions are approximate.

Spatial Projection:

Coordinate System:
MA State Plane Mainland
FIPS Zone: 2001
Units: US Survey Feet
Datum: NAD83

Plot Info:

File: Fig1_DUTargetSoils.mxd
Project No.: 3215
Plot Date: 24 Sept, 2013
Arc Operator: DG
Reviewed by: HG





Figure 2

**DEPLETED URANIUM METAL EXTERIOR SITE CHARACTERIZATION SURVEY
PLAN TARGET PAVEMENT AREAS**



Figure 2 **DRAFT**
DEPLETED URANIUM
METAL EXTERIOR SITE
CHARACTERIZATION
SURVEY PLAN
TARGET PAVED AREAS

Nuclear Metals Inc. (NTCRA)
Concord, Massachusetts

Note:
All locations and dimensions are
approximate.

Spatial Projection:
Coordinate System:
MA State Plane Mainland
FIPS Zone: 2001
Units: US Survey Feet
Datum: NAD83

Plot Info:
File:Fig2_DUTargetPaved.mxd
Project No.: 3215
Plot Date: 24 Sept, 2013
Arc Operator: DG
Reviewed by: HG



**Figure 3
Excavated DU Metal**





Appendix A

Example Survey Package



DU Metal Site Exterior Characterization Survey Plan
Nuclear Metals, Inc. Superfund Site
August 2013
Appendix B – RWPs

NMI Site Radiological Work Permit			
Type: <input checked="" type="checkbox"/> General <input type="checkbox"/> Specific			
RWP No.: NMI-007		Revision: 0	
Issue Date: 7/26/13		Expiration Date: 7/26/14	
TASK INFORMATION			
Building(s): Exterior areas		Area(s)/Room(s): Demarcated areas with elevated soil contamination	
Work Area/Description of Work: Tours, inspections, inventories, radiological surveys, sampling, limited decontamination of materials, and other work activities that do not have the potential to disturb the soil.			
Task Description: General tours of the controlled areas, identification, inventory, groundwater sampling, and minimally invasive activities.			
ALARA			
Radionuclide of Concern: U-238			
Contamination Levels			
Total: 10,000 to 1 million dpm/100cm ²	Removable: 0 to 3,000 dpm/100cm ²	Dose Rates: BKG to 200 uR/hr	Airborne Levels: <0.4 DAC hrs
Dosimetry Requirement: <input checked="" type="checkbox"/> Whole Body (TLD) <input checked="" type="checkbox"/> DRD <input type="checkbox"/> Other A single DRD may be issued to a tour group or other personnel not performing invasive activities who are only required to access restricted areas for short durations			
Personal Protective Equipment			
<input type="checkbox"/> Disposable Coveralls <input type="checkbox"/> With Hood <input checked="" type="checkbox"/> Disposable Lab Coat <input type="checkbox"/> Disposable//Reusable Shoe Covers <input checked="" type="checkbox"/> Inner Glove (Nitrile) <input checked="" type="checkbox"/> Outer Glove (latex, nitrile or equivalent) <input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses		<input type="checkbox"/> Dust Mask Respirator (N-95/P-100) <input type="checkbox"/> Half-Face APR (specify cartridge) <input type="checkbox"/> Full-Face APR (specify cartridge) <input type="checkbox"/> PAPR Helmeted (specify cartridge) <input type="checkbox"/> PAPR Hooded (specify cartridge) <input checked="" type="checkbox"/> Safety Shoes	
Special Instructions/Considerations: Area and personal air monitoring for radionuclides are not required as long as exposures are maintained < 0.4 DAC hrs. The project manager or RSO may modify PPE based on individual tasks. Modification shall be in writing and attached to this RWP.			
Personnel Instructions			
Notify project management prior to entering radioactive restrictive areas. Personnel must self monitor for contamination upon exiting the radiologically controlled area. Notify project management prior to removing any material or equipment from the radiologically controlled area. Individuals using this RWP shall be trained and shall sign the briefing sheet indicating they have read and understand the requirements for entry and exit of controlled areas.			
Prepared By/Date:			
Approved By/Date:			



DU Metal Site Exterior Characterization Survey Plan
Nuclear Metals, Inc. Superfund Site
August 2013
Appendix B – RWPs

NMI Site Radiological Work Permit			
Type: <input type="checkbox"/> General <input checked="" type="checkbox"/> Specific			
RWP No.: NMI-008		Revision: 0	
Issue Date: 7/26/13		Expiration Date: 7/26/14	
TASK INFORMATION			
Building(s): Exterior areas		Area(s)/Room(s): Demarcated areas with elevated soil contamination	
Work Area/Description of Work: Inspections, inventories, surveys, sampling, decontamination, waste packaging, size reduction of waste, and other work activities that have the potential to disturb the soils.			
Task Description: Sampling, dismantlement, movement, decontamination, size reduction, packaging of radiologically impacted materials, landscaping, grading, and excavation or movement of soils.			
ALARA			
Radionuclide of Concern: U-238			
Contamination Levels			
Total: 10,000 to 1 million dpm/100cm ²	Removable: 0 to 100,000 dpm/100cm ²	Dose Rates: BKG to 200 uR/hr	Airborne Levels: <0.4 DAC hrs
Dosimetry Requirement: <input checked="" type="checkbox"/> Whole Body (TLD) <input checked="" type="checkbox"/> DRD <input type="checkbox"/> Other A single DRD may be issued to a tour group or other personnel not performing invasive activities who are only required to access restricted areas for short durations			
Personal Protective Equipment			
<input checked="" type="checkbox"/> Disposable Coveralls <input type="checkbox"/> With Hood <input type="checkbox"/> Disposable Lab Coat <input type="checkbox"/> Disposable//Reusable Shoe Covers <input checked="" type="checkbox"/> Inner Glove (Nitrile) <input checked="" type="checkbox"/> Outer Glove (latex, nitrile or equivalent) <input checked="" type="checkbox"/> Hard Hat <input checked="" type="checkbox"/> Safety Glasses		<input type="checkbox"/> Dust Mask Respirator (N-95/P-100) <input type="checkbox"/> Half-Face APR (specify cartridge) <input type="checkbox"/> Full-Face APR (specify cartridge) <input type="checkbox"/> PAPR Helmeted (specify cartridge) <input type="checkbox"/> PAPR Hooded (specify cartridge) <input checked="" type="checkbox"/> Safety Shoes	
Special Instructions/Considerations: Personal air monitoring for radionuclides are required to ensure that personnel exposures are maintained < 0.4 DAC hrs. The project manager or RSO may modify PPE based on individual tasks. Modification shall be in writing and attached to this RWP.			
Personnel Instructions			
Notify project management prior to entering radioactive restrictive areas. Personnel must self monitor for contamination upon exiting the radiologically controlled area. Personnel shall sign in and out on the RWP Entry/Exit Record. Notify project management prior to removing any material or equipment from the radiologically controlled area. Individuals using this RWP shall be trained and shall sign the briefing sheet indicating they have read and understand the requirements for entry and exit of controlled areas.			
Prepared By/Date:			
Approved By/Date:			



Job Safety Analysis Nuclear Metals, Inc. Superfund Site Soil Sampling/DU Metal Unearthing		
TASK	HAZARDS	CONTROLS
Pre-Construction Safety Meeting.		All employees assigned to this task will attend a pre-construction safety meeting, which will include the pertinent JSAs, Standard Operating Procedures, types of potential hazards, and actual hazards present and controls for those hazards.
Prepare drums for soil samples and dress in appropriate PPE.	Cuts from edges on metal containers, pinch points, strain of muscles from lifting heavy objects.	All employees assigned to this task will wear work gloves, steel toed boots, hardhats and safety glasses while moving the drum at any time. Drums shall be moved using a rough terrain forklift under the operation of a fully trained worker. A drum dolly if available may also be used. Full drums shall be closed, secured and relocated to site specific storage areas. At no time shall drums be left open.



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	Inspect work area	Stinging insects, poisonous plants, ticks, electrocution, traffic (struck by)	<p>Check the proposed sample location. Inspect area for poison ivy, holes, burrows, nests. Be aware of ticks, tuck pant legs into socks and treat clothes with insect repellent with DEET. Perform post tick check, on pant legs, head and clothes following work in vegetated areas.</p> <p>Inspect proposed excavation area for underground and overhead utilities (site lighting, etc.).</p> <p>Workers to utilize traffic control measures such as orange safety cones or barricades when work is conducted in driveways or parking areas.</p>
	Sample collection	<p>Physical injury from hand tools (shovel, hand auger, sifters)</p> <p>Inhalation of dirt or dust during work activities.</p> <p>Inhalation or dermal contact of dirt or dust after work activities</p> <p>Exposure to radiation hazards (ionizing)</p>	



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	All Activities	Back, hand, or foot injuries during manual handling of materials.	<p>Workers should inspect materials for slivers, jagged or sharp edges, and rough or slippery surfaces.</p> <p>Workers should wipe off greasy, wet, slippery, or dirty objects before attempting to handle them.</p> <p>In most cases, gloves or other protection should be used to prevent hand injuries.</p> <p>Routes should be surveyed for obstacles (debris, holes etc.) prior to moving materials from one location to another.</p> <p>All three main factors in manual lifting (load location, task repetition, and load weight) must be considered when evaluating what is safe or unsafe to lift.</p> <p>All manual handling of heavy or bulky objects should be carefully planned to avoid injuries and damage to equipment.</p>



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	All Activities	Heat Exhaustion or Stroke	<p>Avoid strenuous work in ambient temperatures over 80 degrees F.</p> <p>Wear light-colored clothing, shaded sunglasses, and hat that provide shade and adequate air movement. Wear sunblock to avoid sunburn/skin damage.</p> <p>Find cool, shady area for breaks or respite from heat.</p> <p>If worker feels dizzy, has a headache, has cool, moist, or pale skin or is weak, immediately move to a cooler environment, loosen tight clothing, provide air circulation to area, and provide small amounts of cool water to drink.</p> <p>If worker has a change in level of consciousness, high body temperature, red, hot skin, rapid or weak pulse, or rapid or shallow breathing, call the emergency phone number and give care in accordance with #4 above.</p>
	Unsafe Conditions	All Potential Hazards	<p>Where a situation presents a hazardous condition, the exposed employee will be removed from the hazardous area until all necessary precautions have been taken to eliminate the hazard and ensure their safety.</p>



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Other Information: Development Team: Created: JSA: JSA No:	Required Training: Work to be performed by fully trained and qualified worker, Review and sign Specific RWPs Review and be familiar with equipment and sampling procedures/protocols.	Required Personal Protective Equipment (PPE) Work gloves, safety glasses, steel toed boots, traffic vests and PPE in accordance with RWP
	James Leonard, Site Health Safety Officer; Kreig Martinek, EH&S Specialist 8/20/2013 Soil Sampling EQ-010	